



INA-03170
Low Noise, Cascadable
Silicon Bipolar MMIC Amplifier

T-74-13-01

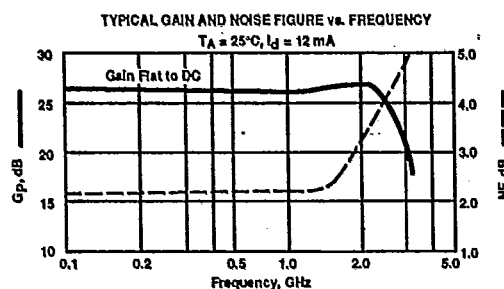
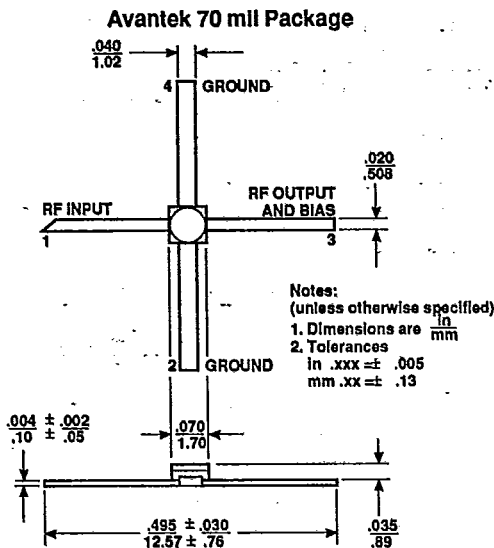
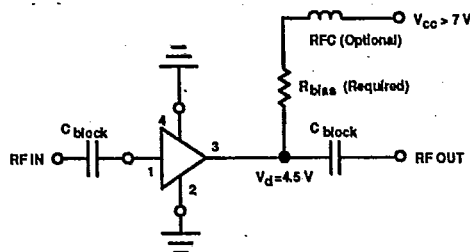
Features

- Cascadable 50 Ω Gain Block
- Low Noise Figure: 2.5 dB typical at 1.5 GHz
- High Gain: 26.0 dB typical at 1.5 GHz
- 3 dB Bandwidth: DC to 2.8 GHz
- Unconditionally Stable ($k > 1$)
- Low Power Dissipation
- Hermetic Gold-Ceramic Surface Mount Package

Description

Avantek's INA-03170 is a low-noise silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) feedback amplifier housed in a hermetic, high reliability package. It is designed for narrow or wide bandwidth commercial, industrial and military applications that require high gain and low noise IF or RF amplification with minimum power consumption.

The INA series of MMICs is fabricated using Avantek's 10 GHz f_T , 25 GHz f_{MAX} ISOSAT™-I silicon bipolar process which uses nitride self-alignment, submicrometer lithography, trench isolation, ion-implantation, gold metallization and polyimide inter-metal dielectric and scratch protection to achieve excellent performance, uniformity and reliability.

**Typical Biasing Configuration****Electrical Specifications¹, $T_A = 25^\circ\text{C}$**

Symbol	Parameters and Test Conditions: $I_D = 12\text{ mA}$, $Z_0 = 50\ \Omega$	Units	Min.	Typ.	Max.
G_p	Power Gain ($ S_{21} ^2$) $f = 1.5\text{ GHz}$	dB	24.0	26.0	28.0
ΔG_p	Gain Flatness $f = 0.01\text{ to }2.0\text{ GHz}$	dB		± 0.5	
$f_{3\text{ dB}}$	3 dB Bandwidth ²	GHz		2.8	
ISO	Reverse Isolation ($ S_{12} ^2$) $f = 0.01\text{ to }2.0\text{ GHz}$	dB		37	
VSWR	Input VSWR $f = 0.01\text{ to }2.0\text{ GHz}$			2.0 ³	
	Output VSWR $f = 0.01\text{ to }2.0\text{ GHz}$			3.0 ³	
NF	50 Ω Noise Figure $f = 1.5\text{ GHz}$	dB		2.5	3.0
$P_{1\text{ dB}}$	Output Power at 1 dB Gain Compression $f = 1.5\text{ GHz}$	dBm		1.0	
IP_3	Third Order Intercept Point $f = 1.5\text{ GHz}$	dBm		10	
t_D	Group Delay $f = 1.5\text{ GHz}$	psec		200	
V_d	Device Voltage $f = 1.5\text{ GHz}$	V	3.5	4.5	5.5
dV/dT	Device Voltage Temperature Coefficient	mV/ $^\circ\text{C}$		+5	

Notes: 1. The recommended operating current range for this device is 8 to 20 mA. Typical performance as a function of current is on the following page.

2. Referenced from 10 MHz Gain (G_p).

3. VSWR can be improved by bypassing the bias directly to ground.

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Absolute Maximum Ratings

Parameter	Absolute Maximum ¹
Device Current	25 mA
Power Dissipation ^{2,3}	200 mW
RF Input Power	+13 dBm
Junction Temperature	200°C
Storage Temperature	-65°C to 200°C

Thermal Resistance^{2,4}: $\theta_{j\text{c}} = 150^\circ\text{C/W}$

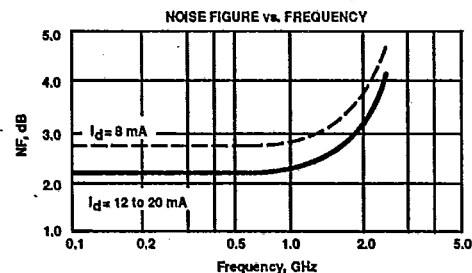
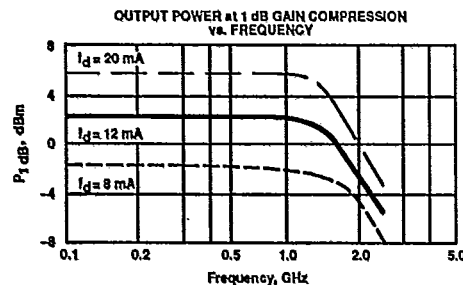
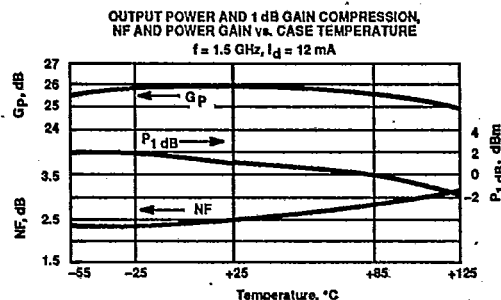
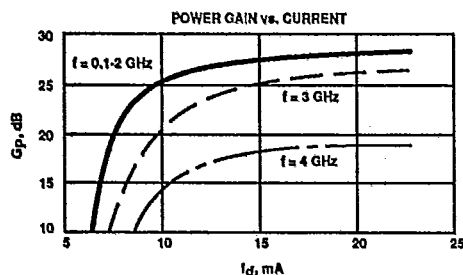
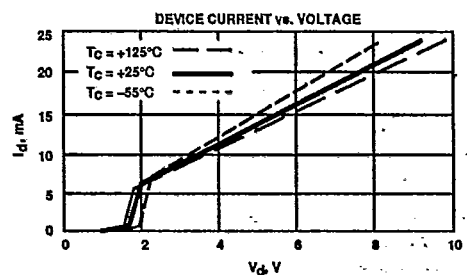
Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2. TCASE = 25°C
3. Derate at 6.7 mW/°C for $T_C > 170^\circ\text{C}$.
4. See MEASUREMENTS section "Thermal Resistance" for more information.

Typical Performance, $T_A = 25^\circ\text{C}$

(unless otherwise noted)

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Typical Scattering Parameters: $Z_0 = 50\ \Omega$ $T_A = 25^\circ\text{C}, I_d = 12\text{ mA}$

Freq. GHz	S ₁₁		S ₂₁			S ₁₂			S ₂₂		k
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang	
0.05	.35	178	26.6	21.48	-4	-35.9	.016	9	.56	-1	1.24
0.10	.35	176	26.6	21.42	-7	-36.5	.015	6	.56	-4	1.29
0.20	.34	172	26.6	21.37	-14	-36.5	.015	-1	.56	-7	1.30
0.40	.34	164	26.5	21.19	-28	-36.5	.015	-5	.54	-13	1.33
0.60	.33	158	26.4	20.91	-41	-38.4	.012	2	.53	-18	1.58
0.80	.32	152	26.3	20.69	-54	-37.1	.014	5	.51	-22	1.46
1.00	.32	147	26.2	20.48	-67	-36.5	.015	4	.50	-27	1.41
1.20	.32	141	26.2	20.40	-80	-39.2	.011	13	.49	-32	1.79
1.40	.31	133	26.3	20.73	-93	-37.7	.013	25	.48	-38	1.57
1.60	.31	125	26.5	21.15	-106	-37.1	.014	28	.47	-45	1.47
1.80	.30	117	26.8	21.84	-121	-35.4	.017	30	.46	-52	1.28
2.00	.27	106	26.9	22.20	-138	-37.1	.014	33	.42	-62	1.48
2.50	.15	94	26.6	21.48	-177	-35.4	.017	23	.31	-79	1.44
3.00	.16	159	23.7	15.32	133	-34.4	.019	42	.16	-72	1.78
3.50	.28	150	19.8	9.81	99	-35.4	.017	28	.19	-60	2.71